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## I. NITROSAMINES

Experiments using model LTF-5E cigarettes to study the pyro-synthetic formation of tobacco-specific nitrosamines (TSNA) have continued (1,2). TSNA have been detected in low, but varied, levels in all LTF-5E fillers prepared to date with a trend for higher levels of preformed TSNA in LTF fillers with higher nicotine content. Addition of nitrate at different concentrations to the LTF filler with nicotine does not appreciably change the TSNA content (1). Based on transfer studies which showed low transfer rates of preformed TSNA to smoke, all of these LTF fillers with low amounts of preformed TSNA can be used in smoke studies. When nitrite was added to the LTF formulation, considerably higher levels of TSNA were found in the filler with NNK over 1000 ng/g (2).

The possibility of solvents, reagents or glassware contributing to a background level of TSNA in samples was eliminated by appropriate control analyses (1). Analysis of a completely different LTF formulation (LTF-IIA) (3) indicated no detectable TSNA. Other possible sources of TSNA in LTF-5E fillers are being investigated.

As reported previously, TSNA in smoke were detected from an LTF filler containing nicotine, but in the absence of a nitrate precursor (4). When a higher level of nicotine was added to the LTF filler without nitrate, NNK in SS was the only TSNA to increase with the higher nicotine level (2).

The TSNA content of smoke from LTF fillers with ~2% nicotine and varying levels of nitrate (5) was determined (1). Only SS NNK values indicated a dependence on nitrate. Nicotine and nitrate in the LTF at levels comparable to 2R1 filler yielded lower than expected MS TSNA or SS NNN and NAT. These results suggest that pyrosynthesis of NNN and NAT in tobacco may involve other sources of nitrosating species or other factors which influence the reaction(s). Nitrite, added as an alternate nitrosating precursor to the LTF filler with nicotine also gave relatively low MS and SS TSNA levels (2).

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Examination of the use of 2R1F instead of 2R1 cigarettes as the basis of comparison for the LTF studies has continued (2). The TSNA level in MS smoke from 2R1F cigarettes with filters removed is somewhat higher than the level from 2R1 MS. This difference reflects the effect of the butt tobacco in 2R1 cigarette on delivery of TSNA into MS smoke. The net increase in TSNA measured in the butts is much greater than the amount which would normally be retained by butt filtration. Ascorbyl palmitate, an inhibitor of nitrosamine formation, was injected into the butt portion of 2R1 cigarettes to determine if the increased TSNA in butts was due to pyrosynthetic formation (2). The butt TSNA level showed a large reduction with only a slight decrease in MS TSNA. Further work in this area is planned.

## II. PAH

An internal standard (ISTD) method for the GC analysis of PAH III fractions has been established (6). Using biphenyl as the internal standard, two ISTD modes for determining baselines were compared to the default mode without an ISTD for integrating the total area of the PAH III fraction as well as for a single component (pyrene). The integrated area of the discrete peaks of a total PAH III fraction accounts for ~62% of the injected amount of material. The remaining 38% of the injected sample consists of components below the baseline and probably a small amount of non-volatile, undetected material.

## III. MAINSTREAM SMOKE STUDIES

Filter efficiencies were determined for a set of model cigarettes with identical CA filters using impaction-trapped CSC and TPM deliveries (7). The cigarettes included single component fillers (bright, burley, oriental, ES, SS) and one blended filler. Their filter efficiencies ranged from 20 to 34% with no dependence on CSC or TPM delivery. The theoretical contribution of single components to the blended cigarette MS CSC or TPM and the theoretical total delivery were then calculated. Excellent agreement was observed between the theoretical and actual deliveries for both filtered and non-filtered cigarettes (8). Similar calculations were performed using TPM, nicotine and FTC tar deliveries of the same cigarettes smoked by the CI lab. Again, good agreement was found between calculated and actual blend deliveries (7).

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To determine the effect of varied puff volume and puff duration on TPM delivery and S/M activity of the TPM, 100% DBC burley cigarettes were smoked on the SAVA smoking machine (7). The smoking parameters included the normal 2-sec 35cc puff, a 1-sec 35cc puff and a 2-sec 70cc puff. The TPM deliveries from the

35cc puffs were similar even though the flow velocity through the cigarettes differed. The 70cc puff had almost twice the delivery of a normal puff. Samples of TPM were dissolved in DMSO (1 ml DMSO/10 mg TPM) for S/M testing.

#### IV. REFERENCES

1. Kinser, R. Notebook No. 8137, pp. 17-20.
2. Morgan, R. Notebook No. 8102, pp. 77-80.
3. Lambert, E. Notebook No. 8050, p. 36.
4. Tafur, S. 6908 Monthly Progress Report. Monthly Progress Report 84-236; 1984 August 15.
5. Petri, D. Notebook No. 7701, pp. 153, 155, 162.
6. Levins, R. Notebook No. 8109, pp. 27-29.
7. Hellams, R. Notebook No. 7700, pp. 196-197.
8. Hellams, R. D. Six model cigarettes' impaction trap yield, filter efficiency data, and calculated contribution of varied blend components to the IT MS CSC delivery of a blended cigarette. Memo to Dr. E. B. Sanders; 1984 August 21.

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